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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/589,359

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Hirokazu Tada

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EXAMINER

LE, THAO X

ART UNIT

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/589,359	<b>Applicant(s)</b> TADA ET AL.	
	<b>Examiner</b> Thao X. Le	<b>Art Unit</b> 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 14 August 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 August 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>8/14/06</u> .   | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Drawings***

1. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 3, 5-10, and 13-17 are rejected under 35 U.S.C. 102(e) as being anticipated by US 6828583 to Heeger et al.

Regarding claim 1, Heeger discloses a light-emitting transistor in fig. 1a, which is characterized in that it comprises:

a) a gate electrode (ITO), col. 8 line 45, covered with an insulating film ( $\text{SiO}_2$ ), col. 8 line;

b) a first source/drain electrode, fig. 1(a) provided on the insulating film and made of an electron- injecting material whose work function is equal to or lower than 4.26 electron-volts;

c) a second source/drain electrode provided separately from the first source/drain electrode on the insulating film and made of a hole-injecting material whose work function is higher than 4.26 electron-volts; and

d) a light-emitter layer (polymer), col. 8 line 24, provided on the insulating film between the first source/drain electrode and the second source/drain electrode and made of an organic semiconductor.

With respect to “electron- injecting material whose work function is equal to or lower than 4.26 electron-volts” and “a hole-injecting material whose work function is higher than 4.26 electron-volts”, Heeger discloses Au (hole injection) and Al, Ca, Ba (electron injection), col. 8 lines 65-66 and col. 9 lines 1-3. The claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established. *In re Best*, 195 USPQ 430, 433 (CCPA 1977) and MPEP 2112.01.

Regarding claim 3, Heeger discloses the light-emitting transistor according to claim 1, which is characterized in that the second source/drain electrode includes an

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adhesive base layer made of the electron-injecting material and covered with the hole-injecting material, col. 10 lines 8-9 (gold on Cr layer).

Regarding claims 5, 14, Heeger discloses the light-emitting transistor according to claim 1, which is characterized in that the electron-injecting material is aluminum, magnesium, calcium, magnesium-silver alloy, or a combination of two or more of these materials, col. 9 lines 1-2.

Regarding claims 6, 15, Heeger discloses the light-emitting transistor according to claim 1, which is characterized in that the hole-injecting material is gold, platinum, indium tin oxide, chromium, nickel or a combination of two or more of these materials, col. 8 line 66.

Regarding claims 7, 16, Heeger discloses the light-emitting transistor according to claim 1, which is characterized in that the light-emitter layer includes a light emitter (polymer) in which a material of an area that is in contact with the first source/drain electrode is different from that of another area that is in contact with the second source/drain electrode, and the area on the side of the first source/drain electrode is made of an electron transport material and the area on the side of the first source/drain electrode is made of a hole transport material, fig. 1a.

Regarding claims 8, 17, Heeger discloses the light-emitting transistor according to claim 1, which is characterized in that the thickness of the insulating film satisfies a condition for an interference condition for an emission wavelength of the light emitter layer.

With respect to “the insulating film satisfies a condition for an interference condition for an emission wavelength of the light emitter layer” does not result in a structural difference between the claimed invention and the prior art, thus claimed invention is only an art recognized suitability for an intended purpose, MPEP 2144.07, or they do not carry weight because the limitations are either function or intended use that do not limit the claim to a particular structure, MPEP 2111.04; thus structure of Heeger is capable of performing the same function.

Regarding claim 9, Heeger discloses a laser light source in fig. 3, which is characterized in that it comprises:

- a) a gate electrode (ITO) covered with an insulating film (gate oxide);
- b) a first source/drain electrode provided on the insulating film and made of an electron- injecting material whose work function is equal to or lower than 4.26 electron-volts;
- c) a second source/drain electrode provided separately from the first source/drain electrode on the insulating film and made of a hole-injecting material whose work function is higher than 4.26 electron-volts;
- d) a light-emitter layer (polymer) provided between the first source/drain electrode and the second source/drain electrode and made of an organic semiconductor; and
- e) a diffraction grating, col. 9 line 9-14, provided between the first source/drain electrode and the second source/drain electrode in order to diffract light emitted from the light-emitter layer.

With respect to “electron- injecting material whose work function is equal to or lower than 4.26 electron-volts” and “a hole-injecting material whose work function is higher than 4.26 electron-volts”, Heeger discloses Au (hole injection) and Al, Ca, Ba (electron injection), col. 8 lines 65-66 and col. 9 lines 1-3. The claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established. *In re Best*, 195 USPQ 430, 433 (CCPA 1977) and MPEP 2112.01.

Regarding claim 10, Heeger discloses the laser light source according to claim 9, which is characterized in that the diffraction grating is formed on the gate electrode the first source/drain electrode and the second source/drain electrode, fig. 3.

Regarding claim 13, Heeger discloses a light-emitting transistor, which is characterized in that it comprises:

- a) a gate electrode (ITO) covered with an insulating film (gate oxide);
- b) a first source/drain electrode provided on the insulating film and made by stacking a layer of an electron-injecting material (Al), col. 9 line 1, whose work function is equal to or lower than 4.26 electron volts and a layer of a hole-injecting material (Au), col. 8 line 66, whose work function is higher than 4.26 electron-volts;
- c) a second source/drain electrode provided separately from the first source/drain electrode on the insulating film and made by stacking a layer of the electron-injecting material (Al), col. 9 line 1, and a layer of the hole-injecting material (Au), col. 8 line 66, in the same order as the first source/drain electrodes; and

d) a light-emitter layer (polymer) provided on the insulating film between the first source/drain electrode and the second source/drain electrode and made of an organic semiconductor.

Heeger discloses the source and drain electrodes are Au and Al, which can be fabricated of the same metal or metal alloy, or two different materials can be used, col. 9 lines 3-8. Thus, Heeger implicitly discloses the electrode having the combination of Au and Al.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).



6. Claims 4 and 11 are rejected under 35 U.S.C. 103(a) as being obvious over US 6828583 to Heeger et al. in view of Applicant Admitted Prior Art (AAPA) or “Light-Emitting Field-Effect Transistor Based on Tetracene Thin Film” to Aline Hepp of record.

Regarding claim 4, Heeger does not disclose the light-emitting transistor according to claim 1, which is characterized in that the first source/drain electrode includes an adhesive base layer made of the hole-injecting material and covered with the electron-injecting material.

However, AAPA discloses a light-emitting transistor in fig. 1 comprising chromium adhesive layer 131 and 132, specification [0005] on first and second source/drain electrodes 14/15. At the time the invention was made; it would have been obvious to a person having ordinary skill in the art to combine the adhesion layer teaching of AAPA in the light-emitting transistor of Heeger, because it would have improved the adhesion of the source and drain to the substrate as taught by AAPA [0005].

Regarding claim 11, Heeger discloses a laser light source, which is characterized in that it comprises:

- a) a gate electrode covered with an insulating film;
- b) first source/drain electrode provided on the insulating film and made of an electron-injecting material whose work function is equal to or lower than 4.26 electron-volts;

c) a second source/drain electrode, electrode made of a hole-injecting material whose work function is higher than 4.26 electron-volts, which is provided on the insulating film and arranged;

d) a light-emitter layer provided between the first source/drain electrode and the second source/drain electrode and made of an organic semiconductor.

See discussion of claim 1 above.

But Heeger fails to disclose so that its comb-teeth engage into the comb-teeth of the aforementioned first source/drain electrode to form a diffraction grating consisting of said two sets of comb-teeth.

However, Hepp discloses a laser light source in fig. 1 comprising a first source/drain comb-teeth and a second source/drain comb-teeth engage into the comb-teeth of the aforementioned first source/drain electrode to form a diffraction grating consisting of said two sets of comb-teeth, fig. 1(a). At the time the invention was made; it would have been obvious to a person having ordinary skill in the art to use the comb-teeth source and drain electrode teaching of Hepp in the laser light source of Heeger, because it would have created a OFET where the light emission intensity can be modulated by the gate and drain voltage as taught by Hepp, see Introduction last paragraph.

7. Claim 12 is rejected under 35 U.S.C. 103(a) as being obvious over US 6828583 to Heeger et al. in view of US 6845114 to Patton et al.

Regarding claim 12, Heeger discloses a laser light source, which is characterized in that it comprises:

- a) a gate electrode covered with an insulating film;
- b) a first source/drain electrode provided on the insulating film and made of an electron-injecting material whose work function is equal to or lower than 4.26 electron-volts;
- c) a second source/drain electrode provided separately from the first source/drain electrode on the insulating film and made of a hole-injecting material whose work function is higher than 4.26 electron-volts;
- d) a light-emitter layer provided between the first source/drain electrode and the second source/drain electrode and made of an organic semiconductor;

See discussion of claim 1 above

But Heeger fails to disclose a dielectric multi-layer film provided on an optical path from the light-emitter layer to an outside, which causes an interference of light having a predetermined wavelength within an emission band of the light-emitter layer.

However, Patton discloses a laser source in fig. 1 or 2 comprising an active laser element 40, col. 4 line 63, a dielectric multi-layer film 50, col. 4 line 64, provided on an optical path from the light-emitter layer to an outside, which causes an interference of light having a predetermined wavelength within an emission band of the light-emitter layer. At the time the invention was made; it would have been obvious to a person having ordinary skill in the art to combine the stack of dielectric layer teaching of Patton in the laser light source of Heeger

in order to create a reflective to laser light over a predetermined range of wavelength as taught by Patton, col. 5 lines 55-60.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao X. Le whose telephone number is (571) 272-1708. The examiner can normally be reached on M-F from 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on (571) 272 -1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

20 Sept. 2007

/Thao X Le/  
Primary Examiner, Art Unit 2814